Continuous Broadband Monitoring of Strain Changes near the San Andreas Fault

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This grant supports the operation of the long-base strainmeter at Durmid Hill (DHL), near the southern termination of the San Andreas fault—and effectively within the fault zone; this instrument measures crustal deformation in Southern California for periods from seconds to years. The Durmid Hill strainmeter (DHL), by recording strain over this wide range of frequencies, provides a nearly unique bridge between seismology and geodesy that is rarely, if ever, available so close to a fault.

The relevance of these measurements to NEHRP lies partly in their contributions to our understanding of the seismic cycle and how stresses accumulate on faults: for this, there is no substitute for a detailed time history. In addition, the DHL measurements continue to provide a check on any possible anomalies, with a sensitivity that depends on distance from the site. This sensitivity is especially high for the "Coachella" segment of the San Andreas fault, which poses the primary risk to the Coachella Valley—and perhaps to the San Bernardino/Riverside area; it was concern about this fault segment that led to the building of the DHL strainmeter. Together with the data from the long-base instruments at Piñon Flat Observatory (PFO), the DHL data provide unmatched monitoring of any unusual long-period activity on this fault or others nearby.

The award provides funding ($18.75K) solely for operation of the strainmeter at DHL; and in the past year (the period covered by the first year of this award) we have continued to do so. The most important result for this period is that the pattern of strain accumulation has returned to what we have observed during most of the period of operation (since 1995): the long-term rate, after a perturbation in the summer of 1999, and especially following the M 7.1 Hector Mine earthquake (1999:289:09) and the very-nearby M 5.1 and 4.6 triggered-events (and subsequent aftershocks), has headed back to its previous secular rate; we have not seen any additional "strain events" of the type we saw during the last half of 1999, which we believe are related to local fault slip. In particular the strain rate remained unchanged during the Brawley seismic swarm that occurred in June 2000; the largest event in this sequence was M 4.5.

While the strainmeter has generally continued to operate well, the year has not been free of operational problems. Beginning in late 1999 we experienced an apparently laser-related problem that proved quite intractable. We made trips to the site, involved the laser's designer in the

trouble-shooting process (the laser being rather specialized), and eventually succeeded only by means of swapping equipment with the systems at PFO. In fact the problem was never fully isolated, it being a rather subtle "noise" problem (not affecting the long-term strain), but it was fully suppressed.

One noteworthy advance this year (beginning on day 2000:268) was the addition of a real-time high-speed telemetry link, courtesy of the Anza Seismic Network. The strainmeter data is now continuously recorded at a sample rate of 1 Hz using this system, with the data archived by the Anza group. This telemetry provides both redundancy and high-speed data in the event of significant earthquakes or other transient events.